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A review on cost analysis of building construction by using autoclaved aerated concrete block (AAC), fly ash brick and clay brick as masonry component

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ABSTRACT

Burnt clay brick is a predominant construction material used in construction. As we also know that the brick manufacturing process involves CO_2 emissions which leads to producing global warming. Hence to overcome these issues we have to focus on saving our environment. To fulfil this objective, new construction materials can be used for construction. Recently AAC blocks were used commonly for building construction and it is a far better alternative material for construction. Therefore this paper discusses the review of Building Construction by using Autoclaved Aerated Concrete Block (AAC), Fly ash brick and Clay brick as Masonry Component.

Keywords— *Autoclaved aerated concrete (AAC), Lightweight, Conventional brick, Reinforced steel, Save, Reduce*

1. INTRODUCTION

It is well known as one of the eco-friendly and green building materials. Recyclability, renewability, porosity, non-toxicity, reusability is AAC features. Its features are lightweight, load-bearing, high insulating, and durability, available and produced in different sizes and strengths. Since 1924 it was developed by a Sweden based Architect, J.A Eriksson. It has become one of the most used building materials in Europe and is rapidly growing in many other countries around the world. Today AAC is used for various construction purposes, such as in residential buildings, commercial and industrial buildings, schools, hospitals, hotels and many other applications due to its remarkable property. We can replace clay bricks with AAC block due to its eco-friendly features. Being aerated, having approx. 50 to 60 % of air, offering light weight and having low thermal conductivity features. AAC feature offers green housings construction and saving in fertile lands and indicate or offer an innovative solution for fly ash disposal issue.

Since AAC is manufactured from the raw materials discussed above with small dosage of the rising agent. After proper mixing and suitable moulding, heat and pressure are applied to create its unique properties. Due to its fire and pest resistant property, and also it is economic and environmentally make it more suitability to the other traditional building materials it is used nowadays.

2. AAC BLOCKS – INDIAN SCENARIO

AAC consists of basic materials that square measure wide on the market. These embody sand, cement, lime, gypsum, water associate in nursing a growth agent. Oxide sand, the material utilized in the best volume in AAC, is one among the world's most swarming natural resources.

At present, there square measure thirty-one producing plants in the Republic of India square measure operating with significant concentration close to Surat. Gujarat: production capability 2000 m3/day against the demand of 3000 m^3/day (Surat has 3-4 plants). In Ahmedabad, one m^3 of AAC blocks prices Rs. 3200 to 3500 whereas one cubic meter of clay bricks would price Rs. 2400-2700. In spite of the worth distinction, the housing industry needs to use AAC blocks thanks to inherent blessings. It's additionally utilized in metropolis, Bangalore, Madras, and Hubli.

3. LITERATURE REVIEW

Ashish Kurweti (2017) compared the various kinds of light-weight weight concrete consistent with their physical properties. Light-weight concrete unit wide employed in everywhere the planet, these kinds of concrete having densities ranges 450-1800 kg/m3 and area unit additional property than burnt brick clay or standard kinds of concrete. During this work, a deep discussion area unit applied between the properties of AAC, CLC, and ash.

Nitin Kumar, Dr. Om Prakash Netula (2017) discussed the applying of AAC Blocks in residential buildings. Within the wake of mixing and trim, it's then autoclaved underneath heat and weight to create its fascinating properties. AAC offers fantastic possibilities to expand building quality and within the in the meantime reduce prices at the event web site. AAC is formed out of a mix of quartz sand and to boot pummelled fly dross (PFA), lime, concrete, gypsum, water, and metal and is solid by steam-curing in autoclaves. thus of its sensible properties, AAC is employed as a district of the many building developments, as an example in camera homes, business and mechanical structures, schools, healing facilities, lodgings, and various completely different applications. AAC contains 60 % to 85% air by volume.

Farid Abed et al (2017) produce a light-weight eco-friendly AAC block. The projected sandwich composite was tested during a variety of stages. Firstly, a preliminary check was conducted to check the projected sandwiching technique. 3 sets of plain sandwich specimens were ready, every with a distinct combination of AAC thickness and concrete thickness. Secondly, completely different concrete and mortar mixes were ready and studied to spot the combination that might yield the most effective sandwich composite. This best combine was known and used throughout the experiment. Thirdly, completely different sandwiching techniques were applied to reinforce bonding at the AAC-concrete interface.

Dr. Sunita Dhote and Nikhil Singh (2016) presented the analysis study of the project conducted to review the feasibleness of fitting associate AAC Blocks industrial plant. The article of this feasibleness study is to supply a framework regarding the technical, economical & money aspects in an exceedingly broader sense and implementation of the project beneath the projected timeframe. In different words, the study is aimed toward analyzing Technical, Economical associated money viability of fitting an AAC Blocks industrial plant. Ash may be a major staple supply (65-70% of finished merchandise is fly ash) and by locating the plant nearly adjacent to staple supply provides manifold advantage each logistically and commercially. The unit is placed in MIDC Butibori that's having direct AAC to any or all corners of the country through 4-laned national highways. The land is ideally placed because it will cater to Nagpur (about 25 Km) and encompassing markets terribly handily the present presumptions are adequate and necessary for the operation of 150000 m^3 AAC unit. The plant style, OH cranes, rails are planned in such a way that the unit will double up its capability just by putting in autoclaving chambers, with changes within the infrastructure within the years to return.

Ghanshyam Kumawat et al (2016) showed the analysis and comparison between the two same G+12 buildings with totally different material in terms of bricks. The bricks that area unit is taken for initial building analysis is burnt clay bricks and for second building analysis is cellular lightweight concrete blocks. This analysis is finished by STAAD-Pro package and in result shows the reduction in the overall price of construction by exploitation CLC blocks.

Ankit Pahade and Pranay Khare (2016) provide a comparison between water uses in each case and additionally provide the number of water we are able to save. Because of growing interest in property development engineers and designers square measure driven quite ever before to settle on materials that square measure a lot of property. Brick masonry and sand-cement plaster consume the tremendous volume of water each in production and solidifying. Greenhouse gas emissions in brick producing method had been a vital issue to heating. As Maharashtra facing a severe drought, there's a shortage of water for construction activities. Thus there's got to replace this material with AAC blocks and mineral plaster.

Khandve P. V. (2016) discussed the appliance of AAC in the housing industry. Autoclaved aerated concrete (AAC), conjointly called cellular concrete or autoclave light-weight concrete. It had been made-up in the middle Nineteen Twenties by the Swedish designer and artificer Johan Axel Eriksson. Nowadays AAC is turning into a preferred artifact. It's light-weight weight, formed pre-cast that at the same time provides structural insulation, hearth resistance, construction economy, and speed. Currently days Blocks, wall panels and roof panels area unit quite common applications of AAC in building construction industry.

Ajay Patre and Laxmikant Vairagade (2016) carried out the project high rise buildings impact of infill wall mistreatment lightweight weight block and traditional bricks. Structural analysis and style in STAAD professional by RSM (Response Spectrum Method). High rise building mistreatment infill ALC (Aerated lightweight weight concrete block) and traditional clay brick masonry are designed for a similar seismic hazard confirming Indian codes. The analytical results of the high rise buildings are going to be compared and analyzed obtained are value, lateral displacement, structure drift, equivalent diagonal strut, axial force and shear force in beam and column once subjected to dynamic earthquake loadings and also the structural properties are optimized for many economical dimensions. The project is additionally geared toward obtaining familiarity with STAAD professional.2008.

Riyaz Sameer Shah (2016) presented the economics of autoclave aerated concrete via conventional brick. This project includes the analysis, design, and estimates of structure, comparing between autoclave aerated concrete and conventional brick in the form of steel consumptions. Currently, it has not seen widespread use in the United States. However, in other parts of the world it uses has been used successfully as a building material.

M. Gunasekaran (2016) replaced natural sand by fly ash. Design AAC mix having mix proportion 1:3 with water cement ratio of 0.6. In these specimens using with lime and without lime, the sand is partially replaced by fly ash and cement is partially replaced by lime. The gypsum is constantly used in the specimens. The Aluminum powder is used at the range of 0.25gm, 0.5gm, 0.75gm and 1 of the total weight of concrete. The properties of the mortar such as density, water absorption and compression strength for 24-hour steam curing were determined.

4. CONCLUSION

Aerated light-weight concrete is in contrast to typical concrete in some combine materials and properties. Aerated light-weight concrete doesn't contain coarse combination, and it possesses several helpful like rarity with higher strength compared with typical concrete, increased in thermal and sound insulation, scale load within the might result in many blessings in decrease structural load and reduce the transferred load to the foundations and bearing capability. Foamed concrete is completely different in the agent of forming air-voids as compared with autoclaved aerated concrete. The air-voids in foamed concrete shaped by foam agent, this operation are a physical process. Against the air-voids in autoclaved aerated concrete shaped by addition metallic element powder to the opposite materials and reaction between them, and this operation is a chemical process. The air-voids are an undiversified distribution at intervals aerated light-weight concrete. Aerated light-weight concrete is thought about the economy in materials and consumption of by-product and wastes materials like ash.

The compressive strength of AAC blocks is relatively over ancient clay brick. These are appropriate for walls in RCC framed building. Utilization of ash ends up in the reduction within the cement consumption within the product which ends up in the reduction of greenhouse gases. The density of AAC block is 1/3 that of ancient clay brick and there's no a lot of amendment in wet condition. It helps in reducing the burden of the structure. Cost of construction reduces by most up to twenty regarded as a reduction of the burden of the wall on beam makes relatively lighter members. As each aspect face of AAC block wall square measure plane, the thickness of plaster is extremely less, so there's substantial reduction up to five hundredths in demand of cement and sand for plasterwork. AAC is factory-made from common and torrential natural raw materials, thus it's very resource-efficient and eco - friendly. The energy consumed within the production method emits no pollutants and creates no by merchandise or toxic industrial waste merchandise.

But to extend the application of AAC product in varied fields, associate degree approach needs investment in prime quality and automatic instrumentation that uses the most recent producing technology. Hence, each existing makers of AAC blocks and new investors that area unit wanting to introduce AAC to their market mustn't limit themselves to a coffee quality and restricted vary of product output.

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